Additional file 3: Tables S1-S3

Table S1. Synthesis matrix for screening for malnutrition

Barriers and facilitators		Interventions which address barriers or facilitators	
Barriers	Facilitators	Soundly evaluated interventions (met 50% or more of MMAT criteria)	Other evaluated interventions (met less than 50% of MMAT criteria)
Barriers or facilitators to screening for malnutrition: patients			
Time taken to complete screening off-putting[45,54]	Screening with six questions is acceptable[54]	Use Short Nutritional Assessment Questionnaire, which has 4 items[40] Use Nutritional Risk Screening 2002, which has 5 items[36] Use Malnutrition Screening Tool, which has 3 items[68]	Use Malnutrition Universal Screening Tool, which has 4 items[53] Use Mini-Nutritional Assessment-Short Form, which has 6 items[54]
Reluctance to reveal dietary behaviour[47]	Patients unaware of being screened if integrated into other assessment[54]	Present screener together with gait speed test[44] Present screener together with questions unrelated to nutrition[41]	Present screener together with questions unrelated to nutrition[37]
Reluctance to be screened[47,48]	Patients willing if purpose of screening is explained[54]	Not addressed	Not addressed
Barriers or facilitators to screening for malnutrition: HCPs			
Lack of resources (staff, time, space, money)[47,69,70]	Patients self-complete where possible[36] Clearly defined responsibilities[47,53,69,70] Screen patients in the GP	Not addressed	Patients self-completed MNA-SF, with 12% being misclassified. Patients tended to score themselves as higher risk than did practitioners. Errors occurred with weight loss and BMI calculation[54]. Offer electronic versions of resources to print[54]

	waiting room (where they spend on average 21 minutes)[47]		Keep resources concise[54]
Staff make mistakes with screening tool[47,68] Lack of familiarity[47] Lack of training[47,69,70]	Provide training in how to screen[47,54,69,70]	Education session[68]	Group training[53,54] Reinforce knowledge through questionnaires[53,54] Consistency in training[53]
No time or money for training[70]	None identified	Use an online training tool[68]	Local training session[54]
Screening tool difficult to use[69]	Familiarity increases ease of use[69]	Monitor accuracy in screener completion and provide feedback[68]	Not addressed
Measuring height or weight impractical[36,40,69]	None identified	Not addressed	Train in alternative measurements[53]
Doubt over reliability of screening tool[47,69]	Use validated screening tool[48,54,68,69]	Malnutrition Screening Tool[68]	Malnutrition Universal Screening Tool[53] Mini-Nutritional Assessment – Short Form[54]
Scepticism towards necessity of screening[47,48,69] Only screen when patient looks underweight[68,69]	Inform about benefits of screening[68,70] - Importance of managing weight[70] - Screener is a record of care[69] Screening identifies malnutrition even if not obvious[54,71] Screening tools can be an objective and non-threatening way to assess nutritional risk[54]	Provide information on malnutrition[68] Screen all patients on admission[68]	Educate about causes[53] Provide underlying theory[53]

Low uptake of training[68]	Make training accreditable[53]	Follow-up with staff who missed training[68] "Quality Improvement Activity"[68]	Visual training materials[53,54] Interactive learning[53]
Low uptake of screening[69]	None identified	Not addressed	Provide ready-to-use screeners[54] Provide screening tool[53] Encourage screening[53] Offer education programme to all staff in practice[53]
Lack of awareness[47,70] Lack of confidence to do screening[69,70]	Raise awareness[70] Training increases knowledge and confidence[69]	Provide printed information[68]	Provide information booklet for practitioner[54] Can report difficulties[53] Reinforce knowledge on screening and treating malnutrition through questionnaires[53,54]
Screening not integrated into practice[40,47,68,69]	Make screening part of routine practice[39,47,48,668,69] - Screen during routine appointments[47,54,68] - Integrate screener into software[54]	Screen on admission to care[68] Screener integrated into documentation[68]	Screen during routine appointment[54]
Staff discouraged by patients' lack of interest[47]	Use case studies to share experience[69]	Raise awareness of patients' reluctance[68]	Provide case studies[53,54]
Lack of care pathways to guide action after screening[48,69]	Effective communication of screening results[48,69]	Care pathway with actions based on screening result[68] Referral pathways (e.g. to dietitian, to dentist, to physiotherapist)[37-39]	Provide reminder of care pathways[54] Refer to dietitian[53,54]

Notes: BMI = Body Mass Index; MMAT = Mixed Methods Appraisal Tool; MNA-SF = Mini Nutritional Assessment-Short form

Table S2. Synthesis matrix for treating malnutrition

Barriers and facilitators		Interventions which address barriers or facilitators	
Barriers	Facilitators	Soundly evaluated interventions	Other evaluated interventions
Barriers or facilitators to nutritional self-care			
Difficulties shopping[43,48,50,49] Cost of eating[43,48,49]	Use walking aids[50] Have food delivered[50] Keep physically active[50,49]	Refer to physiotherapy[39]	Refer to physiotherapy[37,38] Provide ingredients for cooking[45] Provide snacks[43] Discuss social assistance[37]
Difficulties preparing food[45,48,49]	Eat meals out[50] Have simple meals[50] Cook in bulk and freeze portions[49] Ability to cook[50]	Encourage snacking[39]	Encourage snacking[43] Advice on cooking techniques[37] Home modifications to help with visual or auditory impairments[37] Provide recipes with videos[45] Discuss social assistance[37]
Food is not enjoyed[45,50,49]	Putting effort into making food attractive and enjoyable[50,49] Enjoy food from childhood[49]	Identify food preferences[41] Provide recommendations for taste changes[40] Meal suggestions (inspirations)[40] Tailored meal plans[39]	Adapt to taste of participant[43] Focus on preparing attractive meals[50] Food diary analysis[37] Recommend exercise before eating[37]
Unable to manage big portions[48,71]	Eat little, but regularly[48,49,50]	Increase frequency of meals[36,39] Food fortification[36,39-42]	
Problems chewing and swallowing[39,50] Eating alone due to oral health[50]	Address physical barriers[42]	Not addressed	Advice on adaptation of textures[37] Refer to dentist[37] Refer to occupational therapist[38]
Medicine and health conditions interfere with food intake[50,49]	Management of side effects of medication[49] Physical activity	Provide recommendations for dealing with nausea[40]	Review chronic prescriptions[37] Suggest non-pharmacological options to manage sleep, pain, constipation[37]

	prevents obstipation[49]		Recommend exercise before eating[37]
Not recognising the problem[47,51,50,49]	Proactive and open to nutritional support[47,50,49]	Education by dietitian[36] Give ONS[40,44]	Education by dietitian[38] Give ONS[37,51] Monitor progress and adherence to raise awareness[36,37,39,41]
Avoiding 'unhealthy' food[44,50,49]	None identified	Not addressed	Not addressed
Not wanting to burden others[41]	None identified	Involve caregivers[41] Involve family members[39,42]	Information on nutrition for carers[37,38]
Life changes[37,61]	None identified	Assist with problem solving (no further details given)[38]	Discuss depression[34]
Lack of routine[50]	Make cooking part of daily routine[49] Plan ahead[49]	Focus on patient's habits and patterns[41] Identify self-efficacy to make changes[41] Make plans and set goals[40,41]	Not addressed
Being alone[50]	Eat with others[49] Eating alone can be peaceful[49]	Not addressed	Not addressed
Nutrition not important[51,48]	Remind of importance of nutrition[50,49] Remind of link between eating and wellbeing[50]	Not addressed	Not addressed
	Knowledge of importance of fluid intake[49]	Not addressed	Monitor water intake[45]
Barriers or facilitators to delivering nutritional self-care interventions: HCPs			
Lack of time[53]	Hand out resources preferred[54]	Printed info for patients[36,39-42]	Printed info for patients[37]
Low uptake[36,70] Nutrition not	Clarify role of HCP in nutrition care[70]	Not addressed	Not addressed

important[47]			
No confidence in personal effectiveness[54,70] No consensus on best approach[47,70]	Provide training in care pathways[37,69]	Training in treating malnutrition in older adults[40]	Training in risk of malnutrition in older adults[50]
Barriers or facilitators to engaging in nutritional self-care interventions: Patients			
Low motivation[40,70]	Minimise effort for patient[41]	Home visits by dietitians aimed at maximising motivation[36] Discuss motivation[41] Avoid overwhelming with information[41] Praise success[41] Amend plans and goals based on progress to enhance follow-through[39,41] Telephone follow-up[36,39,41,42]	Provide ingredients for cooking[45] Provide snacks[43] Allow feedback on usefulness[45]
Scepticism towards nutritional advice[49]	Understandable, written content[50]	Intervention administered by dietitian[39,41]	Explain function of nutrients[45] Check understanding of instructions[45]
Not enough food suggestions[45]	Provide many simple recipes[45]	Not addressed	Suggest variations of recipes[45] Check liking of food suggestions[45] Different snack every day[43]
Dislike ‘weight gain’ aim[41]	Avoid marketing study as 'weight gain'[41]	Not addressed	Not addressed
	Holistic approach to malnutrition[40,70]	Consultation with both dietitian and GP[36]	Not addressed

Table S3. Synthesis matrix for prescribing or taking ONS

Barriers and facilitators		Interventions which address barriers or facilitators	
Barriers	Facilitators	Soundly evaluated interventions	Other evaluated interventions
Barriers or facilitators to ONS uptake: Patients			
Little awareness of purpose[51,71]	Inform about purpose of ONS[51,71] Discuss ONS initiation with patients[51] Trust in prescriber[71]	ONS recommended by dietitian[36]	Explain that ONS do not replace food[44]
Discomfort in taking ONS[51]	ONS convenient to consume through straw[71]	Not addressed	Not addressed
Negative side effects, e.g. dyspepsia[44]	None identified	Dietitian home visit after one week, and regular telephone contact[36]	Regular follow up, e.g. three-monthly[37] Weekly discussion of patient[38] Monitor patient daily[51] Offer easy opportunity to contact HCP[51]
Unwilling to consume ONS in public[71]	Normalise ONS as food, not medicine [51,71]	Not addressed	Not addressed
Lack of choice of ONS products[71]	Offer different products and flavours[44,53]	Not addressed	Offer different flavours[38,51]
	Compliance influenced by person factors (e.g. reason for taking ONS)[71]		
Barriers or facilitators to prescribing ONS: HCPs			
Cost[48]	More appropriate prescribing can save	Not addressed	Prescribe ONS after full dietetic assessment[53]

	money[53]		
Suboptimal referring and monitoring[53]	Provide ONS education[53]	Not addressed	Educate on ONS[53] Monitor ONS compliance[44,45,51] Provide telecare monitor to monitor adherence[51]
Hard to wean patients off ONS[48]	None identified	Not addressed	Not addressed

Note: ONS = Oral Nutritional Supplements